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POPULAR ENTOMOLOGY.

THE ENGRAVER BEETLES (FAMILY IPIDÆ).

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Beetles of the Family Ipidæ have been described from almost every portion of this continent from Mexico to Alaska, and will probably be found wherever their food-plants occur. Many species are described from the West Indies, and a very large number from Central and South America, and from Europe. Many are known from Japan, Australia, Ceylon, South Africa and elsewhere. A few species seem almost world-wide in distribution; others are known only from small regions. A number of species, e.g., *Eccoptogaster rugulosus* and *Xyleborus dispar*, have been introduced into America from Europe.

The North American members of the family Ipidæ are usually somewhat elongate and cylindric in form, and brown or black in colour. They vary from one to a little over eight millimeters in length. *Crypturgus pusillus* is one of the smallest species, and *Dendroctonus valens* probably the largest. The legs are rather small and weak, as becomes their habits. The antennæ are short and geniculate, with an extremely large club, which is usually annulated. The vast majority of the Ipidæ cut their breeding tunnels in the bark or wood of trees or shrubs. The chief North American exceptions are referred to below.

Their burrows are of great interest, and often of remarkable regularity and beauty. Those of many species are so characteristic that it is often easy to determine which species has been at work from an examination of the tunnels and galleries alone.

A large portion of our North American species infest coniferous trees, the pines and spruces being especially subject to attack. Of deciduous trees, the oak, beech and hickory suffer severely, and there is scarcely a northern tree but serves as food-plant for one or more species of this family. As a rule

each species has a limited number of food plants, but some, like *Pterocyclon mali*, feed in many trees, both coniferous and deciduous.

According to their habits, the North American species of *Ipidæ* may be separated into four fairly well-marked groups: the Bark-beetles, the Timber- or Ambrosia-beetles, the Twig-beetles, and a fourth group containing a few species of varying habit.

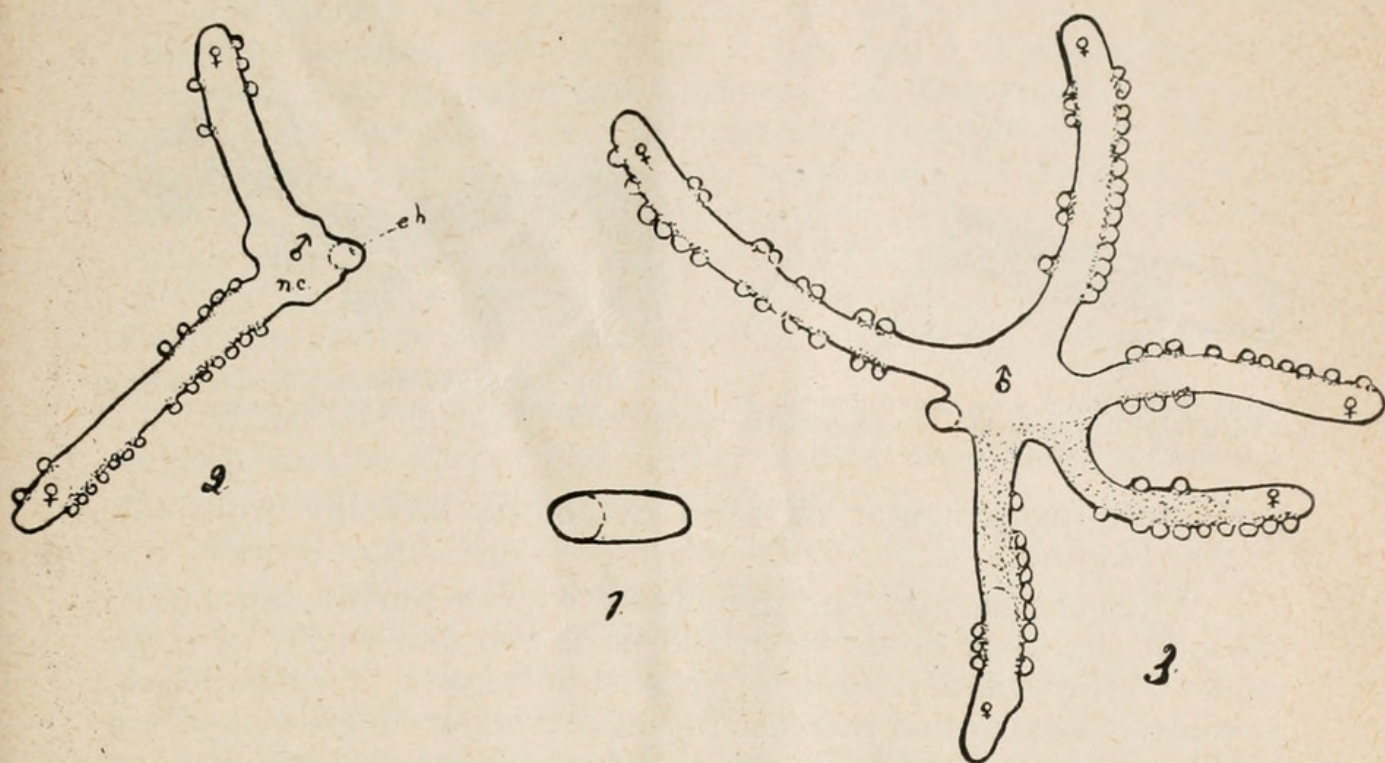
THE BARK-BEETLES.—The first of the above-named groups includes those forms which burrow in the bark, or between the bark and the wood. The adults enter through a hole in the bark, cut in many cases by the male, and drive a primary-tunnel between the bark and wood, usually partly in the bark and partly in the wood, and frequently either parallel with or at right angles to the wood-fibres. A few species burrow entirely in the bark, and others, included here in the Bark-beetles, cut their tunnels just below and parallel to the wood surface. The length of the tunnel varies in the different species from less than an inch to more than a foot. The female does the greater part of the work, while the male guards the opening and removes the chips and refuse. These main-tunnels are usually kept strictly clean. In sweeping the tunnels the beetles move backwards, scraping the refuse with the mandibles back to the fore legs, which pass it on to the middle, and these to the hind pair. When the opening of the tunnel is reached the tip of the abdomen is protruded and the refuse passed up to the hind pair of legs in the manner just indicated, and by the hind legs pushed away from the opening. In cutting the tunnels the beetles constantly revolve, and thus obtain such perfectly cylindrical burrows.

When not at work the male beetle is usually guarding the entrance. By backing into the entrance-hole the declivity of the elytra plugs the opening, and thus presents a complete protection from many enemies.

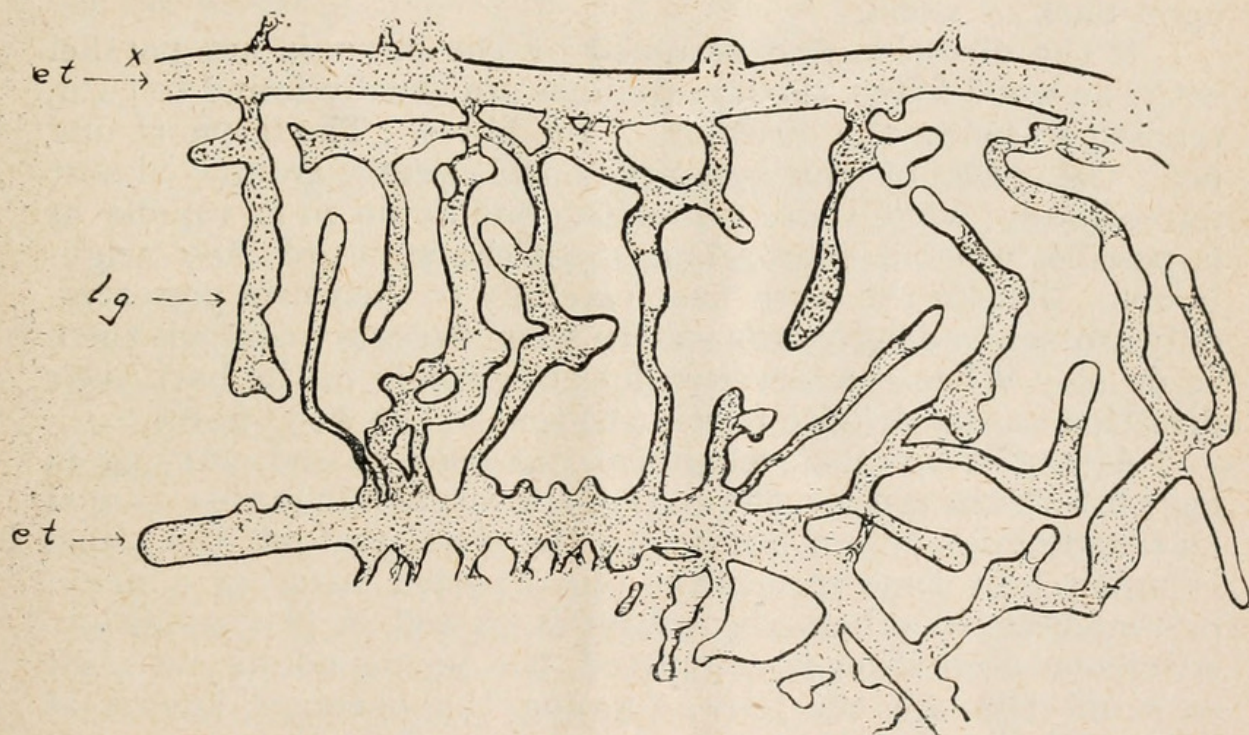
In niches along the sides of the primary-tunnel the whitish, almost transparent eggs are laid, usually one, though sometimes several, in each niche. In some species, *Ips caelatus* and *Dendroctonus simplex*, several eggs are deposited in large niches; while others, *Hylurgops pinifex* and *Dryocoetes autographus*, arrange the eggs in rows along the sides of the tunnel.

When egg-laying is completed the adults of some species die, and their remains may frequently be found long after in the tunnel. Some species, however, cut a new tunnel and rear a second brood.

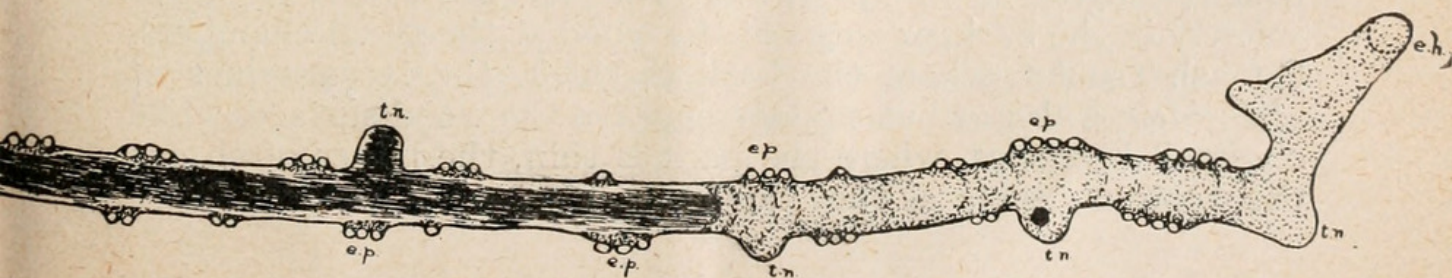
In those species which lay the eggs in masses along the sides of the primary-tunnel, the larvæ burrow in congress through the



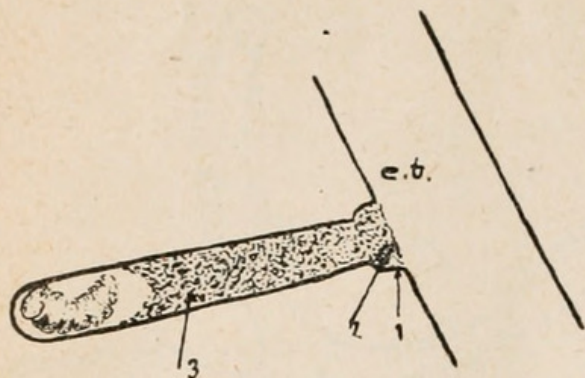
Tunnels of *POLYGRAPHUS RUFIPENNIS* Kirby, in spruce bark. Three stages in the development of the egg-tunnels.



DENDROCTONUS SIMPLEX Lec. Development of larval galleries; larvæ half-grown: e.t., egg-tunnels; l. g., larval galleries.



DENDROCTONUS SIMPLEX Lec. An egg-tunnel showing egg-pockets; e. p., containing eggs; turning-niches, t. n., and entrance-hole, e. h.



IPS BALSAMEUS Lec. Development of larval gallery: 1, egg-niche; 2, egg-packing; 3, excrement of larva; e. t., egg-tunnel.



IPS CAELATUS Eichk. Under side of bark, showing the eggs in the pockets.

bark, forming irregular cavaties extending laterally from the primary-tunnel.

When the eggs are laid in niches the larvæ burrow separately through the bark or between the bark and the wood, at right angles to the primary-tunnels; these side tunnels, larval galleries, or mines, thus formed increase in size as the larvæ grow, and are left completely filled with wood or bark fragments which have passed through the body of the larvæ. The latter feed entirely upon bark or wood.

If the direction first assumed by the larvæ is not parallel with the wood-fibres, the larval-mines are usually found to turn, tending to follow the direction of the fibres. The larvæ at and near the ends of the primary-tunnel swing around almost immediately, while those nearer the middle do so as rapidly as is possible without encroaching upon the mines of their neighbours. Usually the larvæ keep carefully to their own preserves, only crossing a neighbour's gallery when necessity compels them to do so. When the larval mines are entirely in the bark their direction has no definite relation to that of the wood fibres.

After the larval development has been passed, varying in length with the species, the ends of the larval mines are enlarged and sometimes driven down into the wood to form the pupal chamber. In some species the pupal period lasts but a week, or ten days, in others the winter is passed in this condition. After transformation is completed, the young adults cut their way out through the bark, forming the openings known as "shot-holes".

While the primary-tunnel and also the egg-niches are usually engraved in the wood, the larval-mines are often entirely in the bark, or only cut the wood at the pupal-chambers. On ash trunks, where the bark is thick, the larval-mines of *Hylesinus aculeatus* but slightly engrave the wood surface, while on small branches, where the bark is thin, the mines often cut the wood as deeply as they do the bark.

Frequently a number of primary-tunnels, cut by different females, radiate from a common "nuptial-chamber" situated just beneath the common entrance-hole. In such cases, with some species, the male cuts the entrance-hole, the nuptial-chamber and often the beginnings of three or four primary-tunnels. The male is then joined by one or more females, which finish the primary-tunnels and the egg-niches; the work of the male, after the entrance of the females, consists mainly in removing the chips and refuse and guarding the entrance-hole, as already mentioned.

When the primary-tunnel is long, as is the case, *e.g.*, with several species of *Ips* and *Dendroctonus*, there may be one or more "ventilation holes" through the bark.

Before egg-laying begins, whether for the first or second time, the beetles cut "food-tunnels," either beneath the bark of the host-tree or in the bark of twigs or trunk of other trees. Many species cut their food-tunnels as continuations of the larval galleries, and hibernate therein.

In Eastern Canada most *Ipidæ* hibernate as adults, though with many species larvæ and pupæ also occur beneath the bark in the winter.

(To be continued).

ACCESSIONS TO CANADIAN BOTANY—I.

BY EDWARD L. GREENE.

There is before me a small collection of plants which, although in quite too fragmentary specimens, is more than ordinarily interesting in view of the locality from which it has come, namely, a part of extreme north-western Yukon, not far below the Arctic circle, and a region not before touched by any collector. In the interior of the Alaskan peninsula there is a great empire of territory somewhat elevated, and extending far on both sides of the international boundary, which is almost unexplored botanically, and which promises many revelations to the student of plant geography. Many years ago there was submitted to me a small collection from the Porcupine River region, a good part of which showed a flora distinct enough from that of the coastal districts of Alaska, and as totally unlike that of the farther interior south-eastward.

The fragments now at hand from the Canadian side of the boundary, collected in the summer of 1911, by Mr. D. D. Cairnes, have intensified the desire for a more careful investigation



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